

**Korea Water Resources Corporation  
(KOWACO) small-scale hydroelectric  
power plants project**

(the Andong-dam, the Seongnam, the  
Jangheung-dam small-scale hydroelectric power  
plants construction project)

**MONITORING REPORT**

**From 01/01/2008 to 31/12/2008**

Dated: 12 May 2009

## **1. Title of the project activity:**

Korea Water Resources Corporation (KOWACO) small-scale hydroelectric power plants project

- **Date of Registration of project:** 06 Oct. 2006

- **UNFCCC Registration Number:** 584

## **2. Introduction:**

This proposed project activity consists in 2.64 MW of facility capacity and power generation of 15,473,000kWh per year from the bundled three small-scale hydroelectric power plants - the Andong-dam, the Seongnam, and the Jangheung-dam small scale hydro power plant.

None of these three plants are part of a large project, according to Appendix C of the simplified modalities and procedures for small-scale CDM project activities.

KOWACO small-scale hydroelectric power plants project, which will substitute the fossil fuel fired plants by generating 15,473 MWh, has sought a 7 years renewable crediting period starting from 01/01/2007.

## **3. General Description of the project:**

### **3.1 Project Activity**

Small-scale hydroelectric power plants operated by KOWACO generate electricity. Hydro potential generate GHG emission-free electricity and displace an equivalent proportion of electricity generation using fossil fuel.

This project activity is a 2.64 MW hydro electric project. Thus this will approximately bring in 9,689 tons of CO<sub>2</sub> emission reduction annually for 7 years.

This proposed project bundled three small-scale hydroelectric power plants - the Andong-dam, the Seongnam, and the Jangheung-dam small scale hydro power plant in accordance with Appendix C of the simplified modalities and procedures for small-scale CDM project activities.

The commercial operation of each plant has been started as follows:

- The Andong-dam small-scale hydroelectric power plant: 08/09/2003
- The Seongnam small-scale hydroelectric power plant: 16/12/2004
- The Jangheung -dam small-scale hydroelectric power plant: 30/11/2005

Starting date & Crediting Period: 01/01/2007 (7 Years)

### **3.2 Type and Category**

The project falls under ‘Renewable energy project’ of Type I of ‘Appendix B of the simplified modalities and procedures for small-scale CDM project activities’ in that KOWACO small-scale hydroelectric power plants project utilizes renewable energy source. Additionally, the project falls under category D of ‘Electricity generation of a grid’, because electricity generated by renewable energy source is grid-connected.

Project type: Renewable energy projects

Category: D – Grid connected renewable electricity generation

### **3.3 Application of a monitoring methodology**

The project operation has been monitored in accordance with the approved monitoring methodology AMS-I-D. (Ver.8), “Grid connected renewable electricity generation.” The monitoring is based on continuous metering of electricity production as defined in the PDD.

### **3.4 Technical description of the project**

Location of project activity: each power plant of this project is located at the following region.

- The Andong-dam small-scale hydroelectric power plant: Andong city, Gyeongsangbuk-do
- The Seongnam small-scale hydroelectric power plant: Seongnam city, Gyeonggi-do
- The Jangheung -dam small-scale hydroelectric power plant: Jangheung-gun, Jeollanam-do

<Technology description of the small-scale hydroelectric power plants>

Classification		The Andong-dam small-scale hydroelectric	The Seongnam small- scale hydroelectric	The Jangheung-dam small-scale hydroelectric
Wheel	Type	Propeller (Tubular)	Vertical Francis	Horizontal Francis
	Output power	493 KW	372 kW	800 kW
	Rotation	225 RPM	450 RPM	514 RPM
	Unit	3	1	1
Generator	Type	Concentrating induction	Three-phase induction (horizontal acxis)	Three-phase induction (horizontal acxis)
	Output power	500 KW	340 kW	800 kW
	Rotation	225 RPM	450 RPM	514 RPM
Transformer	Type	Mold type	Mold type	Mold type
	Capacity	2,000 kVA	500 kVA	1,000 kVA
	Volatage	3.3 kV / 22.9 kV	380 V / 22.9 kV	3.3 kV / 22.9 kV
	Connection type	△-Y	△-Y	△-Y
	Unit	1	1	1

#### 4. Monitoring methodology & Plan:

The parameter to be monitored is:

Data Type	Data variable	Data Unit	Measured(m), Calculated(c), Estimated(e)	Recording frequency	Proportion of data to be monitored	The method of data archived	The term of data archived
Electricity supplied to the electricity grid	Electricity	kWh	M	Monthly	100%	Electronic	Two years beyond Crediting period

For a small scale CDM project activity the only set of data to be monitored is the net electricity output from the project.

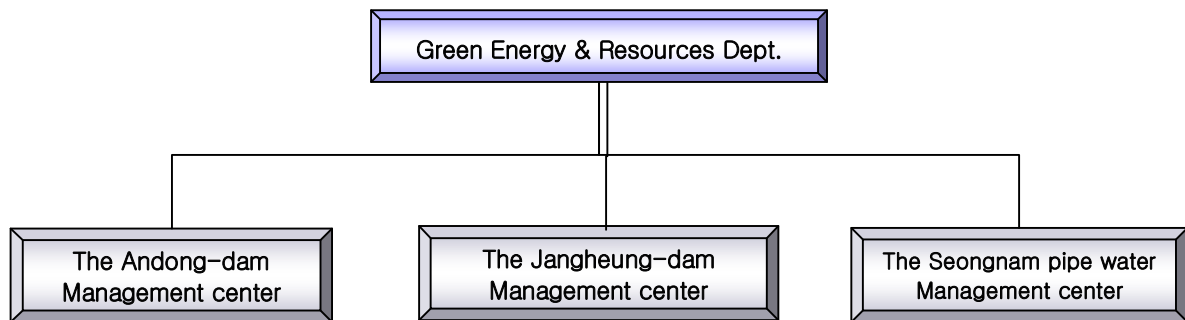
#### 1) Electricity meter to be monitored

Electricity meter has been set up transparently in accordance with “Law regarding measurement” and “Act on operation of electricity market” and measuring electricity is monitored in confirmation of Korea Power Exchange.

Electricity connected to the power-grid is measured by electricity meter installed for power trading system of KPX. And measured data is submitted to KPX for record-keeping everyday.

And the reporting system is as follows:

<Operational and management structure>



Responsible department and persons for the monitoring are as follows:

- Department in charge of monitoring: the Andong-dam management center, the Seongnam pipewater management center, the Jangheung -dam management center
- Responsible department: Green Energy & Resources Dept(GERD).

#### 5. Calculations of annual emission reductions:

To prove accuracy and consistency of monitored data, measured electricity data of KPX is compared with data measured by a generation meter of each facility. GERD of the headquarters collected and archived those data filed and given by each management center.

From doing such a thing, the below monitored results of electricity table is completed based on the amount of power transmission of KPX.

Calculating annual emission reductions is completed according to the PDD.

OM is 0.7807 ton CO<sub>2</sub> eq/MWh and BM is 0.4718 ton CO<sub>2</sub> eq/MWh

$$EF_y = (EF_{OM,y} + EF_{BM,y})/2$$

According to the above calculations, EF(Emission factor) is 0.6262 ton CO<sub>2</sub> eq/MWh. Then, based on the following table that calculated the net emission reductions, the total CERs from January to December 2008 are 7,277.0 tons.

**< Electricity Output & Emissions Reductions >**

Section	Andong-dam	Seongnam	Jangheung-dam	Baseline Emission Factor (tonCO <sub>2</sub> /MWh)	Net Emission Reductions (tonCO <sub>2</sub> )
	Electricity (kWh)	Electricity (kWh)	Electricity (kWh)		
JAN.	451,281.024	172,435.518	537,842.805	0.6262	727.4
FEB.	438,411.888	173,656.042	474,579.302	0.6262	680.5
MAR.	333,145.296	174,628.905	489,382.082	0.6262	624.4
APR.	373,326.624	176,437.087	352,298.416	0.6262	564.9
MAY	516,015.576	187,450.267	400,895.272	0.6262	691.6
JUN.	477,137.736	173,835.832	450,661.125	0.6262	689.8
JUL.	495,734.184	177,475.988	477,104.706	0.6262	720.3
AUG.	520,140.600	177,180.631	449,075.361	0.6262	717.9
SEP.	448,584.984	166,682.392	300,037.320	0.6262	573.2
OCT.	414,220.824	148,352.042	292,846.650	0.6262	535.7
NOV.	362,792.520	81,911.792	210,221.267	0.6262	410.1
DEC.	359,722.224	32,593.614	152,800.929	0.6262	341.4
<b>TOTAL</b>	<b>5,190,513.480</b>	<b>1,842,640.110</b>	<b>4,587,745.235</b>	0.6262	<b>7,277.0</b>

\* Electricity output of each facility is based on the data of KPX.

And emission reductions are calculated by subtraction a maximum error of electricity meters from power generation of facility which is not checked with a revision cycle for electricity meter under 11.Monotoring (c) of “Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories”Ver.8 and paragraph (b) of Article 109 of the 26<sup>th</sup> CDM EB meeting report. So 0.5% is deducted from power generation from 22 Nov. 2008 to 31 Dec. 2008 of Jangheung-dam facility.